5
Plant Connections

How To Select & Handle Plants

PURPOSE:
- To become familiar with wise consumer practices for selecting, handling, and storing plants and their products.

OBJECTIVES:
For youth to:
- give examples of a plant's physical and chemical defense mechanisms.
- discuss ways to minimize the risk of food related illnesses.
- identify qualities that are desirable in plant products.
- identify introduced and native landscape plants.
- discuss the importance of food preservation.
- learn about the commercial production of vegetables.

LESSON TIME:
- Lesson time may vary based upon learning activities selected. Most activities are approximately 30 minutes.

ADVANCE PREPARATION:
- Read the BACKGROUND BASICS on How To Select & Handle Plants.
- Review activities and choose appropriate one(s) to use.
- Collect and prepare materials for appropriate activities.

LEARNING ACTIVITIES

1. WATCH OUT!
2. EVERYWHERE!
3. FIRST CLASS PLANTS
4. GREEN SENSE
5. ON THE SHELF
6. NATURE'S HARVEST

DO

The following are suggestions for using the activities in Lesson 5. The materials needed for each are listed within the activity.

- List several precautions when handling plants in WATCH OUT!
- Identify sources of bacterial contamination in EVERYWHERE!
- Judge a produce exhibit in FIRST CLASS PLANTS.
- Discuss water conserving landscape concepts in GREEN SENSE.
- Identify way of preserving food in ON THE SHELF.
- Compare fresh market to commercial produce in NATURE'S HARVEST.

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REFLECT

After completing the activities in this lesson, help youth reflect on what they have learned with these questions:

What are some examples of a plant's physical defenses?

thorns, spines, barbs

Why is it important to wash fruits and vegetables before eating them?

pesticide residues, harmful bacteria, yeast, and mold may be present

Who set the quality standards for the plants we buy?

government agencies, USDA, FDA

What are some environmental considerations for selecting plants?

amount of rainfall, temperature, soil pH

Why is it important to preserve food?

reduce spoilage, to consume it at a later time

Why is it important to manage the harvest and handling of a crop?

to ensure the freshest product gets to the consumer

APPLY

Help youth learn to apply what they have learned.

- Have youth identify poisonous plants around their homes.
- Have youth research and prepare a report on bacteria that cause food related illnesses.
- Visit a local farmers market, find out what farmers/growers do with blemished produce.
- Visit the IFAS gardening website at: http://solutionsforyourlife.ufl.edu/lawn_and_garden/getting_started/ or listen to Gardening in a Minute broadcasts, available at: http://gardeningsolutions.ifas.ufl.edu/giam .
- Check out this cool virtual tour of the Michigan 4-H Children's Garden. http://4hgarden.msu.edu/kidstour/tour.html
- Experiment with other food preservation methods like drying and freezing.
- Research the harvest, handling, and marketing of other crops (oranges, cucumbers, onions). Compare similarities and differences in production.

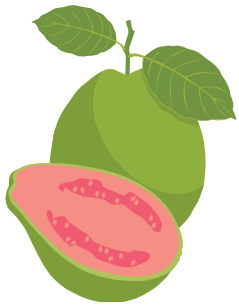
BACKGROUND BASICS … How To Select & Handle Plants

Over 400,000 species of plants exist today. An unknown number of species, perhaps several hundred thousand, existed at one time but are now extinct. Virtually all this diversity came about through evolution by natural selection - survival of the fittest. Because organisms are exposed to various adverse conditions, those individuals best-fit (adapted) to a particular environment are more likely to survive. For any particular aspect of the environment many adaptations are possible. Plants have developed physical and chemical defense mechanisms to cope with adverse environmental conditions. Consider plants growing in freezing winters; frozen soil is physiologically dry because roots cannot extract water from it. They survive because mutations have occurred that cause their leaves to drop in the fall. They also have bark on the stems that reduces the amount of water lost through their stems. Desert plants conserve water in different ways: they are smaller with fewer leaves and have thick waxy cuticles. Another adaption is seen in the aster family (sunflowers, daisies) which produce a group of chemical compounds that discourage herbivores. Other plant adaptions include leaf modifications like thorns, spines, and barbs.

Plant defense mechanisms can have adverse effects on people. It is never a good idea to pick or disturb plants you are unfamiliar with! The following is a list of plant tips to consider when you are dealing with plants:

1. Know the poisonous plants in your house or garden
2. Do not put any plant or plant part in your mouth unless you know for sure it is not poisonous.
3. Don't eat unfamiliar berries; they may be OK for birds but not for us.
4. Don't eat any wild mushrooms.
5. Do not touch plants that have milky secretions.
6. Don't burn unfamiliar sticks; especially for marshmallows or hotdogs.
7. Don't leave dangerous plants near young children or pets.
8. Call the Poison Control Center if you suspect someone has eaten a poisonous plant.
9. Call 911, the police, or an ambulance for emergencies.
10. Stay calm! Most poisonous plants cause a mild reaction and have a cure.

Selecting Adapted Plants



Recognizing and selecting plants based on their adaption to certain environmental conditions is an important component of natural or ecological landscaping. **Natural** or **ecological landscaping** involves plant selection based on the climate and environment of the area. Factors in plant selection include water requirements, growth rate, color, hardiness, nutrient, and pH needs. **Xeriscaping** is a type of ecological landscape design that is water efficient. Xeriscaping requires careful planning and installation. A soil analysis is needed to determine nutrient needs. An efficient irrigation system should be used and properly maintained. The amount of turf grass and annual flowering plants are limited. Drought tolerant perennial flowers and ornamental grasses should be selected. Mulch should be used to cool the surface, prevent erosion, and conserve moisture.

Handling and Preserving Produce

The purpose of food preservation and packaging is to increase the life of foods so that after harvesting and preparation, foods can be stored and shipped to consumers. Microorganisms grow in fresh food because it contains all the nutrients, including water for their growth. Bacteria and mold, including those that can cause food-borne illnesses, are found naturally all around us. Safe handling, cooking, and serving practices are necessary to prevent bacteria from multiplying and causing food related illnesses. Food-borne illnesses have been traced to many types of foods including fruit, vegetables, eggs, meat, and poultry. According to the Center for Disease Control and Prevention, the majority of food borne illnesses can be prevented by improved food handling practices. Although the threat of food borne illness is relatively small, the use of safe food handling techniques will ensure that the threat of food related illness is greatly reduced.

Safe food handling practices:

1. Wash hands with warm soapy water prior to handling food.
2. Keep everything that touches food clean - hands, utensils, bowls, and countertops.
3. Thoroughly wash all produce with clean, drinkable water; use a brush if necessary.
4. When using a cutting board, it is best to use separate boards for each type of food.
5. Direct sneezes and coughs away from food.
6. Store meat, poultry, eggs, milk, cheese, and other perishables in the refrigerator.
7. In the supermarket, pick up cold foods last.
8. Refrigerate leftovers immediately.
9. Keep hot food hot until you serve it.
10. If you are sick, try not handle /prepare foods for others.

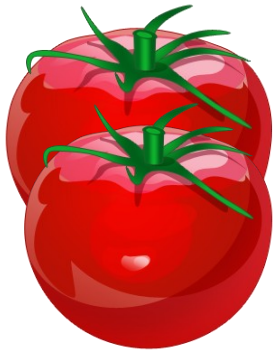
Not all microorganisms are bad, in fact, some are important in making and preserving food products. Bacteria, molds, and yeast are used to turn one food into another (milk + bacteria = yogurt, cabbage + bacteria = sauerkraut, Kimchee) and to create medicines (nutrient agar + mold = penicillin). Sauerkraut or kimchee is an example of a preserved or pickled vegetable food that is changed as a result of microorganisms present on the raw cabbage. Shredded cabbage is mixed with salt and placed in a container in which almost anaerobic conditions can be achieved. The salt is used to extract liquid from the vegetable tissue so that it becomes available for the fermenting bacteria and control growth of undesirable ones. The first bacteria to grow are lactic acid bacteria, such as *Leuconostoc*, which produce carbon dioxide. As the carbon dioxide accumulates and the mixture becomes more acidic (due to the lactic acid) growth of undesirable bacteria is inhibited. Later in the fermentation process more acid-tolerant bacteria (*Lactobacilli*) grow and contribute to the end products of fermentation or pickling.

Selecting Fruits and Vegetables

Judging fruits and vegetables is simply a matter of making choices. Consumers buy produce at the market by selecting those most appealing on the basis of external quality and past experiences. However consumers are not alone in the assertion of produce quality. Government agencies set quality standards for the fruits and vegetables we buy. In order for produce to be considered under quality grade standards it must meet **size**, **color**, and **shape** criteria as well as be **free from defects**. These four major government agencies regulate food safety:

EPA - Environmental Protection Agency

- determine the type and amount of pesticides that can be used by farmers
- sets water quality standards



FDA - Food and Drug Administration

- inspects food processing plants
- enforces labeling, additive, sanitation, and pesticide regulations
- develops standards for the use of food additives

USDA - United States Department of Agriculture

- inspects meat, poultry, and egg products and the plants that process them

State Board of Health

- inspects food processing plants, grocery stores or warehouses, and restaurants
- enforces labeling, additive, sanitation, and pesticide regulations
- sets additional food safety standards

Commercial Production of Fruits and Vegetables

The tomato is not only the most important commercial vegetable in Florida, it is also the most popular garden vegetable. Tomatoes are commercially grown on more than 45,000 acres in Florida. Because of their perishable nature, growers closely manage the harvest, marketing, and handling of crops.

Cultivar selection is one of the most important management decisions made by the grower. A cultivar is a plant variety that retains its features when reproduced. The following characteristics are included in the selection of a tomato cultivar: yield, disease resistance, shipping quality, taste and adaptability.

Cultural practices include physical and mechanical preparations to the area throughout the growth of the crop. Examples of cultural practices include soil preparation, mulching, providing windbreaks, crop establishment, irrigation, fertilization, staking and frost protection.

Tomatoes are subject to damage by a variety of pests: insects, nematodes, fungal and bacterial pathogens, and weeds. Pest control should consist of an integrated pest management (IPM) system which relies on efficient use of all control techniques available.

The Florida tomato industry is based primarily on harvesting tomatoes at the mature green stage. Growers use a combination of external characteristics like size, shape, and color to determine when a crop is ready to harvest. Most tomato packing houses are large, sophisticated, high volume operations. Generally, tomatoes are washed, pre-sized, waxed, sorted, graded, sized, packed into containers, stored, and shipped. Most packaged green tomatoes are stored in ripening rooms which initiates ripening with ethylene treatments. Ethylene gas is used to promote faster, and more uniform ripening before shipping.

Activity 1: Watch Out!

OBJECTIVES:

For youth to:

- give examples of plant's physical and chemical defense mechanisms.
- identify dangerous plants.
- list several precautions when handling plants.

LIFE SKILL:

- Listening and following instructions.

MATERIALS:

- copies of TEN PLANT TIPS Information sheet for each youth
- several poisonous plant guides of Florida (with pictures) for youth to share
- Poison Control Center phone number

TIME:

- 30 minutes

SETTING:

- Indoors and outdoors.

ADVANCE PREPARATION:

- Collect a variety of poisonous plants for youth to view.
- Find a trail or path in your area where you can point out some dangerous plants to youth.

INTRODUCTION

Plants have developed physical and chemical defense mechanisms to protect themselves from predators. Humans are sensitive to some of these defense mechanisms. For example, has anyone ever gotten poison ivy? Is it possible to get poison ivy without touching the plant? (yes, indirect contact can result from touching animals or clothes that have been in contact with the plant) Can you think of some physical defense mechanisms plants use for protection? (thorns, spines) Today, we are going to identify some dangerous plants. Knowing their names, what they look like, and where they grow will help us to protect ourselves from possible harmful effects of coming in contact with them.

DO

- Give each youth a copy of the TEN PLANT TIPS Information sheet. Go over the information sheet aloud with youth.
- Show youth pictures of poisonous plants in your area.
- Have youth review the display plants and compare them to the pictures shown.
- Caution the youth not to touch any of the display plants. If youth do touch the plants, make sure they wash their hands thoroughly.
- Take a short walk and try to identify poisonous or harmful plants in your area.

REFLECT

What are some examples of a plant's physical defenses?

thorns, spines, barbs

Can you name plants that have these defense measures?

roses have thorns, cacti have spines

What plants have chemical defense measures?

poison ivy, Rhododendron, foxgloves

Why would a plant need defense mechanisms?

to protect itself from grazing or browsing

What's your best defense against poisonous plants?

stay away from them

What are some general precautions one should take when handling plants?

refer to the TEN PLANT TIPS

APPLY

- What plants might be poisonous in your house?

  philodendron, English ivy for other examples refer to a poisonous plant book or search online for plants relative to your area

- Where is a good place to hang the TEN PLANT TIPS in your house?
- Make a list of important telephone numbers (e.g. poison control, fire and rescue, police) and place it by the phone or add to your cell phone contact list.
- Ask a Master Gardener to show youth other common poisonous plants in the area.

Ten Plant Tips

1. Know the poisonous plants in your house/garden.
2. Don't put any plant or plant part in your mouth unless you know for sure it is not poisonous.
3. Don't eat unfamiliar berries; they may be O.K. for birds but not us.
4. Don't eat any wild mushrooms; eat only the ones from the supermarket.
5. Don't touch plants that have milky secretions.
6. Don't burn unfamiliar sticks; especially not for marshmallows or hot dogs.
7. Don't leave dangerous plants near young children or pets.
8. Call the Poison Control Center if you suspect someone has eaten a poisonous plant.
9. Call 911, the police or an ambulance for emergencies.
10. Stay Calm! Most poisonous plants cause a mild reaction and have a cure.

Poison Control Center hotline: _____

Activity 2: Everywhere!

OBJECTIVES:
For youth to:
- learn that microorganisms are everywhere.
- understand that microorganisms are both harmful and helpful.
- identify sources of bacterial contamination.
- discuss ways to minimize the risk of food related illnesses.

LIFE SKILL:
- Acquiring, analyzing, and using information.

MATERIALS:
- copies of the BACTERIAL PLATING EXPERIMENT Activity sheets for each youth
- 1 Petri plate with sterile nutrient agar for each youth
- contamination sources (quarter, fruits, vegetables)
- transparent tape
- permanent marking pen
- colored pencils and markers
- resource materials on bacteria that cause food related illnesses

TIME:
- 20 minutes
- 30 minutes 2 to 4 days after the plates have been inoculated

SETTING:
- A comfortable room with tables and chairs.

ADVANCE PREPARATION:
- Complete experiment 2-3 days before conducting activity with youth so they can see what might happen when they finish the activity.

INTRODUCTION

Have you ever washed an apple before you ate it? Why? (fruits and vegetables may have microorganisms on them that can make you sick) Microorganisms like bacteria and mold, including those that make you sick, are found naturally all around us. Safe handling, cooking, and serving practices are necessary to prevent bacteria from multiplying and causing food related illnesses. It is important that you, as consumers, understand that a simple practice like washing your hands, fruits, and vegetables can help minimize food related illness. Today, we are going to learn that microorganisms are everywhere.

DO

- Give each youth a copy of the BACTERIAL PLATING EXPERIMENT Activity sheets.
- Have each youth select a contamination source from the list provided.
- Give each youth a Petri plate and caution them to keep the lid on until they are ready to contaminate it.
- Once the plates have been contaminated have youth wrap transparent tape around the edge of the plate to seal it.
- Using a permanent marker, have youth label the bottom of the plate with their name and type of contaminant.
- Have youth wash their hands after handling the plates.
- Incubate the plates upside down at room temperature for two to four days. Keep the plates out of direct sunlight.
- After bacteria and mold has formed, have youth examine the plates.
- Have youth draw their plates on the BACTERIAL PLATING EXPERIMENT Activity sheet and discuss the results.

REFLECT

What percent of the plate was covered by microorganisms?

answers will vary

Which contamination source had the highest percent of microorganisms?

answers will vary

Why do we wash fruits and vegetables before eating them?

bacteria, mold, yeast may be present

Which fruits and vegetables do you have to worry about the most?

those fruits and vegetables where you eat the skin

The word microorganism simply means a living being too small to be seen without a microscope. Can you think of other microorganisms besides bacteria and molds?

viruses, protozoa, yeasts

Are all bacteria and mold harmful? Can think of an example of a bacteria or mold that benefits us?

molds are used to produce cheeses, penicillin

bacterium is used in yogurt

other microorganisms eat oil spills and sewage

APPLY

- Have youth research and prepare a report on bacteria that cause food related illnesses. (Examples: *Salmonella, Clostridium, Staphylococcus*). The report should include the life cycle of the bacteria and ways to minimize the risk of food related illnesses.
- Have youth collect pictures of products that are made with the help of microorganisms. (bread, beer, wine, green olives, cheese, yogurt, soy sauce, salami, pickles, and pepperoni) Have youth look up the starting ingredient of each product and the microorganism needed to turn the ingredient into the product. Have youth share their findings.
- Conduct an internet search of USDA or university sources for safe food handling, cooking, and serving information.

Bacterial Plating Experiment

Materials:

Petri plates with sterile nutrient agar (a general food source for microorganisms)

transparent tape

contamination sources (quarter, fruit)

permanent marking pen

Procedure:

1. Obtain one Petri plate with sterile nutrient agar. Keep the lid on until you are ready to contaminate the plate.
2. Select a contamination source and wipe on the agar surface (try not to tear the agar).

Contamination Sources:

hands - gently touch your fingers or lightly trace an S pattern on the agar

hair - place a piece of your hair on the agar

cough - hold the plate 2-3 inches from your mouth and cough into the agar

fruit - rub the skin of an apple, pear, plum, etc. on the agar

quarter - rub a quarter over the surface of the agar

3. Seal the plate by wrapping scotch tape around the edge.
4. Label the bottom of the plate with a permanent marker. Be sure to include your name, date, and contamination source.
5. WASH YOUR HANDS.
6. Incubate the plates upside down at room temperature (78-85^{o}F) for 2 to 4 days. Keep the plates away from direct sunlight. You incubate the plates upside down so that water droplets don't fall into the agar.

Bacterial Plating Experiment (continued)

7. Two to four days after the plates have been inoculated examine your plate (keep the lids on your plates) and draw what you see.

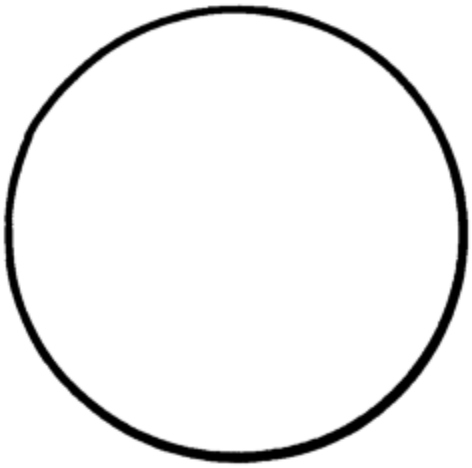
   Be sure to note the:

   - # of colonies
   - color of microorganisms
   - presence of fuzziness
   - shape of the colonies
   - percent of plate that is covered by microorganisms

   Hints:

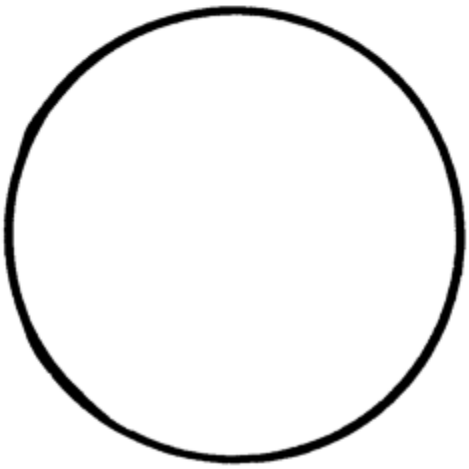
   - Fuzzy things are molds.
   - Blobs that aren't fuzzy may be bacteria or yeast.
   - Each blob is a colony. Each colony is made up of millions of individual cells.

Note: It is not important to identify the organisms on the plates. The point is to understand that microorganisms are everywhere.



Plate

Date



Plate

Date

8. Return the plate (upside down) to its incubation area. After two more days, reexamine the plate and draw what you see.

Activity 3: First Class Plants!

OBJECTIVES:
For youth to:
- identify the qualities that are desirable in produce.
- judge a produce exhibit using preset indicators of quality.
- learn how to exhibit and select produce.

LIFE SKILL:
- Decision making.

MATERIALS:
- copies of EXHIBITING VEGETABLES activity sheet for each group
- five potatoes of varying quality
- paper and marker to label each potato
- pencils

TIME:
- 30 minutes

SETTING:
- A comfortable room with tables and chairs

ADVANCE PREPARATION:
- Purchase 5 potatoes –label 1 to 5 and display for youth to "judge".

INTRODUCTION

I want you to imagine that you are in the produce section of the grocery store and you're hungry for an apple. You walk into the produce section, right in front of you is a display of apples loose in a bin, to the left of you is a display of apples in 5 pound bags, and further down on the left are apples in packages of four. Besides the number of apples per package, are there any other differences in the apples? (yes, loose apples are generally of higher quality, larger, and unblemished) Government agencies like the United States Department of Agriculture (USDA) set quality standards for the fruits and vegetables that we buy. For instance, in order for a potato to be considered U.S. No.1 each tuber must have the shape and color characteristics of the variety being graded, it must be at least 1-7/8 inches in diameter, and free from defects. When a fruit or vegetable crop meets U.S. No. 1 grade quality standards it can be sold at a higher price. Today, we're going to use some of the USDA's standards to grade a potato exhibit.

DO

How plants grow in different soil types:

- Pass out EXHIBITING VEGETABLES Activity sheet.
- Review the grading standards and classifications with youth.
- Exhibit 5 potatoes of varying quality on a table.
- Have youth judge each potato using the grading standards on the activity sheet.
- Have youth total their grading sheets and assign a classification (excellent, good, worthy, unworthy) to each exhibit.

REFLECT

If you were creating quality standards for apples, what characteristics would you choose to indicate quality?

size, appearance, shape, color, aroma, taste, ripeness

Who sets quality standards for the plants we buy?

government agencies, USDA, FDA

Would you buy produce with blemishes if you could pay less for it?

answers will vary

What do you think happens to produce that is too blemished to be sold?

feed to animals, donated to food banks, plowed under, burned

What are some economic considerations of standardizing the quality of produce?

higher quality plants cost more

APPLY

- Visit a local USDA laboratory or agricultural inspection station to learn more about grades and standards for produce.
- Visit a local farmers market, ask the farmers/growers what they do with their blemished produce.
- Look up grades and standards for other vegetable crops.
- Check out this site for the National Junior Horticulture Judging Competitions at: http://www.njha.org/projects_hortid_judging.html

Exhibiting Vegetables

Grading standards are indicators of quality. Grade each of the five exhibits and record a score for each in the table below.

EXHIBITS

Indicator of Quality	Possible Score	1	2	3	4	5
Appearance of the exhibit	20					
Labeling	10					
Uniformity (shape, color, size)	30					
Firmness	20					
Freedom from Blemishes	20					

Vegetables falls into four classifications:

1. **excellent** - clean, free from injury, uniform in size, shape, color, and best quality
2. **good** - clean, free from injury, fairly uniform and good quality
3. **worthy** - fairly clean, free from serious damage, fairly uniform, and fair quality
4. **unworthy** - dirty, seriously damaged, not uniform, and poor quality

Classification	Total Score
Excellent	90-100
Good	75-89
Worthy	60-74
Unworthy	0-59

Which exhibit had the highest classification ranking? The lowest?

How many of your classmates agreed with you? Disagreed with you?

Would you consider buying an unworthy vegetable from a grocery store? Why? Why not?

Activity 4: Green Sense

OBJECTIVES:
For youth to:
- discuss environmental considerations for selecting plants.
- identify introduced and native landscape plants.
- discuss water conserving landscape concepts.

LIFE SKILL:
- Managing resources.

MATERIALS:
- research information for youth to share (eg. soil surveys, plant identification keys, county statistics, and local extension bulletins)
- paper bag for each youth
- scissors
- paper
- pens and pencils

TIME:
- 45 minutes

SETTING:
- A comfortable room with tables and chairs

INTRODUCTION

Have you ever driven by a lawn, an office, or a school yard on a rainy day and noticed that the sprinklers were on? Every day in the United States we use approximately 137 billion gallons of water for irrigation. Florida's increasing population and periodic drought conditions are placing demands on our water supply. In response to limited water resources a number of landscaping ideas have evolved to reduce water and maintenance requirements in the landscape. The concept of **natural** or **" Florida-friendly" landscaping** involves plant selection based on the climate and environment of the area. Today, we're going to identify plants in our landscape and determine if they were ecologically landscaped.

DO

- Using soil surveys, county statistics, and extension bulletins have youth research environmental characteristics in their county. Characteristics should include: amount of rainfall, temperature ranges, soil type, and native plant species.
- Give each youth a brown paper bag then move outdoors.
- With permission, tour a nearby landscape and have youth collect 1 or 2 plant samples (stems and leaves) and place them in the bags. Be careful not to damage the plant when collecting samples.
- Bring plant samples back to the classroom and have youth identify them using plant keys or other resource materials. Try to determine if the plants are introduced or native species.
- Have youth determine if the maintenance needs of the plants collected are met through the natural environmental characteristics of their county.
- Press plant samples that you are unable to identify and send or take them to your local horticultural extension agent at the County Extension Office for identification.

REFLECT

What are some environmental considerations for selecting plants?

rainfall, temperature, and soil characteristics of the area

Can you think of ways to conserve water in your landscape?

plant drought tolerant plants, don't water when its raining

Did you identify any introduced plants (not native) that were ecologically landscaped for the area?

answers will vary

What would happen if you introduced a water loving plant into the landscape then forgot to water it?

it would eventually die

Did you identify any Florida-friendly plants that you have in your yards at home?

answers will vary

APPLY

- Meet with the landscape maintenance person in your school, church, or meeting facility and find out why particular plants were used in the landscape. Ask if you can help install an automatic rain shut off device (required by state law) on the sprinkler system to conserve water.
- Take a landscape tour of the local extension office or nursery. Ask a horticultural extension volunteer to point out the water conservation concepts used in the landscape.
- Have youth research and report on other water-conserving landscape techniques like using mulches, grouping plants with similar water needs, and creating windbreaks.

Activity 5: On The Shelf

OBJECTIVES:
For youth to:
- identify various ways of preserving food.
- discuss the importance of food preservation.
- demonstrate the food preservation method of pickling.

LIFE SKILL:
- Working with groups.

MATERIALS:
- copies of the KIMCHEE RECIPE Activity for each student
- 1 to 1-1/2 heads of Chinese cabbage (bok choy, napa) for each group
- chili powder
- crushed garlic
- non-iodized or pickling salt
- 2-liter soda bottle for each group
- 4 wooden spoons
- muslin or cheese cloth
- pH indicator paper (litmus paper)
- 4 heavy bowls or jars to keep cabbage submerged
- strainer
- measuring spoons
- 4 large bowls or stock pots
- scissors
- knife

TIME:
- 30 minutes

SETTING:
- A comfortable room with tables and chairs.

ADVANCE PREPARATION:
- Make kimchee six and three weeks in advance to use in pH comparison.
- Cut the top off the 2-liter bottles.

INTRODUCTION

Without the techniques of canning, drying, and pickling, humans would have a difficult time preserving food. Pickling is one of the most ancient forms of food preservation. It involves the conversion of sugar into lactic acid through the growth and activity of acid producing bacteria know as *Lactobacilli.* As the bacteria grow they create a high acid environment where spoiling organisms cannot grow. Can you think of any foods that are preserved by pickling (e.g. sauerkraut, yogurt, pickles, kimchee) Today, we're going to make kimchee, an ancient Korean recipe for pickling Chinese cabbage.

DO

- Give each youth a copy of the KIMCHEE RECIPE activity
- Divide youth into three or four groups.
- Review the kimchee recipe and instructions with youth.
- Have youth follow the kimchee recipe.
- Once the kimchee is finished have youth compare the pH and appearance of their kimchee to the kimchee made six and three weeks in advance.
- Avoid any risk from bacterial contamination, do not allow youth to taste the kimchee.

REFLECT

Why is it important to preserve food?

so it won't spoil, to consume it at later time

Name different ways of preserving food.

freezing, drying, canning, pickling

The cabbage has to sit out for 5 to 6 weeks, what will stop it from rotting?

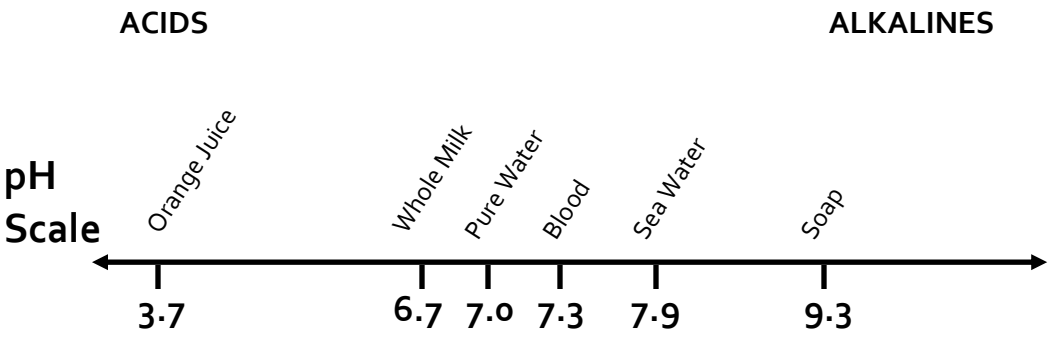
acid producing bacteria, *Lactobacilli*

Did you eat anything today that was preserved? What was it and how was it preserved?

answers will vary

APPLY

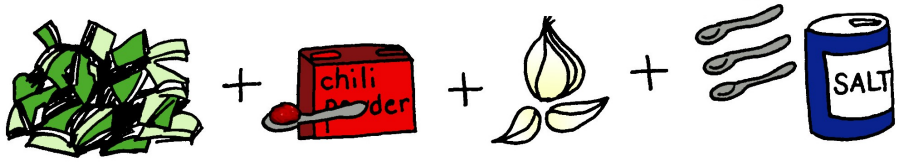
- Visit your local home economics extension agent or a canning club and watch a canning demonstration.
- Experiment with other food preservation methods like drying and freezing.
- Research the food preservation techniques of early settlers. How do the methods differ from today?
- Determine the pH of several liquids. Prepare a table showing the pH range of (acidic to alkaline) of the liquids.



Kimchee Recipe

To make your Kimchee you will need these ingredients:

1 to 1 1/2 heads of Chinese cabbage (bok choy, napa) cut into chunks
1 tsp chili powder
2 cloves crushed garlic
3 tsp pickling salt (non-iodized)



and you will need these materials:

2-liter soda bottle cut below the shoulder
teaspoon for measuring
large bowl or stock pot
wooden spoon
muslin or cheese cloth
heavy bowl or jar to weight down cabbage
pH indicator paper (litmus)
room temperature of 68° to 72° F
knife
scissors

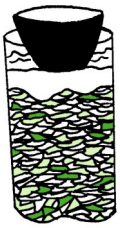
WHAT YOU DO:

1. In a large container, thoroughly mix all ingredients and let stand for 5 minutes.

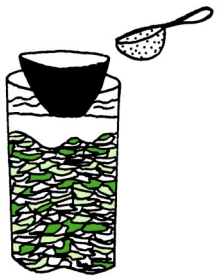
2. Fill the bottle with the cabbage mixture. Pack the cabbage firmly and evenly into the bottle with a wooden spoon.

3. Using the wooden spoon, press down firmly until juice comes to the surface.

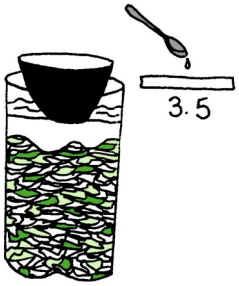
4. Cover the cabbage with a clean, thin, white cloth (muslin or cheese cloth) and tuck the edges down against the inside of the container.



5. Set a clean, heavy bowl or jar on the cloth to keep the cabbage submerged under the juice.



6. Formation of gas bubbles indicates fermentation is taking place. Using a strainer, remove and discard scum formation when needed.



7. Each week take a teaspoon of juice out of the container and check its pH using litmus paper. When the pH drops to about 3.5, your kimchee is done! (5 to 6 weeks)

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
pH						

Answer the following questions. You may need to research the pickling process further.

1. What stops the cabbage from rotting?

2. *Lactobacilli* are anaerobic bacteria which are found almost everywhere in your environment. What is an anaerobe? What conditions are needed for them to live?

3. Why did you measure the pH of your kimchee?

Activity 6: Nature's Harvest

OBJECTIVES:
For youth to:
- learn about the commercial production of tomatoes.
- compare fresh market and commercial tomatoes.

LIFE SKILL:
- Communicating and relating to others.

MATERIALS:
- copies of Tomato Production Guide for Florida (Circular 98C, University of Florida Cooperative Extension Service) or other tomato production information for reference
- ripe store bought tomato
- ripe garden or road stand tomato
- 2 paper plates
- 2 green tomatoes
- 1 ripe banana
- small paper bag
- paper clip
- paper
- pens and pencils

TIME:
- 30 to 45 minutes; 3-4 days

SETTING:
- A comfortable room with tables and chairs.

ADVANCE PREPARATION:
- Label the bottom of two paper plates "store bought" and "garden", slice the tomatoes and place on the plates. Before the discussion, have youth taste and compare the tomatoes. Can they distinguish between the two?

INTRODUCTION

Have you ever compared the taste of a store bought tomato with one fresh from the garden? How were they different? Did you know that commercially grown tomatoes are picked green then ripened on their way to the store? Does anyone know how commercial growers and retailers ripen tomatoes? (ethylene gas) What would happen if growers waited until their tomatoes were ripe before they shipped them? (they would be over ripe or rotten when they arrived at the store) Because of the perishable nature of food, growers closely manage the harvest, marketing, and handling of crops. Today we're going to learn more about tomato production in Florida.

DO

- Give youth a copy of the Tomato Production Guide for Florida and any other tomato production information available for reference.
- Divide youth into four groups: 1) cultivars; 2) cultural practices; 3) pest management; and 4) harvest and handling.
- Have each group prepare a report or poster demonstrating their role in the production of tomatoes.
- Have groups share their information with the class.
- Demonstrate the ripening process by placing a ripe banana and a green tomato in a paper bag. Fold the top of the bag and place a paper clip on the fold to keep it closed.
- Place a green tomato on the counter about 3 feet from the paper bag.
- Every other day have youth compare the tomato in the bag to the tomato alone on the counter.

REFLECT

Why is it important to manage the harvest and handling of a crop?

to ensure the freshest product gets to the consumer

Which tomato ripened fastest?

the tomato in the bag

Why did we put a ripe banana in the bag with the tomato?

bananas release ethylene gas, a natural ripening agent

What interesting fact did you learn about the production of tomatoes?

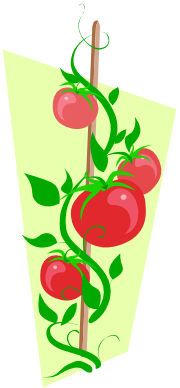
answers will vary

How does the commercial production process of tomatoes differ with a home gardeners production process? Are their any similarities?

answers will vary, encourage youth to speculate

APPLY

- Write or visit your local agricultural extension agent and request information on the commercial production of crops grown in your area.
- Tour a local vegetable or fruit processing plant or packing company.
- Research the harvest, handling, and marketing of other crops (oranges, cucumbers, onions). Compare similarities and differences among production.
- Compare the production process of a commercial grower, roadside stand farmer, and home gardener.



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